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SUBURBAN SUSTAINABILITY INDEX: AN APPROACH TO ASSESS SUBURBAN SUSTAINABILITY IN METROPOLITAN JAKARTA, INDONESIA

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ABSTRACT

In the arena of academic discourse, there is a kind of 'dissatisfaction' over the indicators of sustainability. Although Indonesia has formally adopted its sustainable development indicators from the United Nations, the research to find compatible indicators for a certain context still to continues. There are hundreds and/or even thousands of reports tell us the new indicators of sustainability with various methods and approaches. But very few are paying attention to – or at least – building sustainability indicators of suburban areas, especially the metropolitan suburbs of Jakarta. Therefore, this study tried to develop a typical suburban sustainability indicator called the Suburban Sustainability Index (SSI). As an empirical case, we observe four suburbs which located in hinterland of Metropolitan Jakarta: South Tangerang City, Tangerang City, Depok, and Bekasi. Based on the three dimensions of sustainability (social, economic, and environment), we developed 30 indicators and tested them with Min-Max analysis. More than that, we also conduct Index Analysis to assess the sustainability status of the four suburbs. We found that three areas were less sustainable, and one area was quite sustainable. Further elaboration on these findings is presented in this article.

Keyword: *regional sustainability, social-economic and environmental sustainability, min-max analysis*

1. INTRODUCTION

The Sustainable Development Goals (SDGs) or Agenda 2030 were declared on 25 September 2015, coinciding with the United Nations General Assembly (UNGA) at the United Nations Office in New York, USA. The meeting agreed to seventeen SDGs grouped into three pillars: (1) social; (2) economic; (3) environment; and (4) legal and governance. One of the seventeen goals is sustainable cities and community.

Theoretically, the four pillars are referred to as Elkington (1997) introducing the concept of "triple bottom lines" (social, economic, and environmental) which is then made basic pillars of interconnected in the concept of sustainability. Although policymaker established the indicator the researcher continue to develop indicators. Seghezzo (2009) states, although in empirical research the concept of "triple bottom lines" is used as the main reference, still the concept has not been considered final and becomes a debate among academics, especially for cases that are Specific and Local. Moreover, various research reports show that sustainability issues have shifted from a global perspective to the meso-perspective: local, regional and even sectoral (Finco and Nijkamp 2001).

Therefore, research to develop specific, regional and local indicators are still growing. Not only so, the analytical tools used to develop, test, and assess their sustainability levels are also very varied. Fauzi and Oxtavianus (2014), for example, measure the sustainable development of all provinces in Indonesia using the GDRP index indicator on the economic dimension, the Human Development Index (HDI) indicator on the social dimension, and the Environmental Quality Index (IKLH) on the environmental dimension. The analytical techniques they use are composite indices. Besides, observations on the sustainability of regional development in Indonesia are also conducted by Bachril et al. (2017). His research uses 4 (four) dimensions,

namely social, economic, environmental, and institutional. The analytical tools used are principal component analysis (PCA).

Bachril et al. (2017) also saw the sensitivity of each indicator over the four dimensions they have developed. Also, Pravitasari et al. (2018) developed a composite index that they refer to as Regional Sustainability Index (RSI) which they say can be used to evaluate the sustainability performance of Regional development in Indonesia. With factor analysis Techniques (FA), Moran Index, and LISA statistics, they developed ten indicators on the economic dimension, ten indicators on social dimensions, and ten indicators on environmental dimensions. Recent research that develops a composite index to measure regional sustainability in Indonesia is done by Rahma et al. (2019). They use two indicators on the economic dimension, three indicators on the social dimension, one) indicator on the environmental dimension. The analytical techniques used are Min-Max analyses combined with arithmetic and geometric averages as well as entropy values.

In a case study at the provincial level in Indonesia, Erlinda et al. (2016) conducted a regional sustainability assessment for Jambi province. They used five indicators for the economic dimension, four indicators for the social dimension, and four indicators for the environmental dimension. The method it uses is multi-Criteria Analysis with the FLAG approach. Furthermore, the research conducted by Margiyono et al. (2019) in the province of Kalimantan for example, using the Regional Sustainable Account (RSA) method, they developed seven indicators on the economic dimension, six indicators on social dimensions, and eight indicators on the environmental dimension.

Reading the entire study, it seems that Indonesian suburban issues and phenomena, especially the Jakarta suburbs have not received widespread attention, such as South Tangerang City, Tangerang City, Depok City, and Bekasi city. The social, spatial, economic, environmental and cultural phenomena in the suburbs are so complex and multidimensional (Yandri et al. 2018). In Indonesia, the main issue of suburban areas as recorded by the Firman (2000) is the problem of land conversion as a result of the construction of housing projects (Firman 2004). Firman and Fahmi (2017) stated that the change was more driven by the role of the private sector and the role was triggered by central government regulations and policies.

With its status as a suburban area, those areas accept the spill-over effect such as economic, social, spatial and environmental impacts. One of the indications of spill-over effect is the continued increase in population, both as a result of the migration of residents from the village to the city or migration from the city centre to the suburbs. BPS Data on the four areas such as shows, the population from time to time continues to increase. In the last seven years (2010-2018), the average population growth rate increased by 2.46 per cent in Tangerang City, 3.13 per cent in South Tangerang city, 3.53 per cent in Depok city, and 2.45 per cent in Bekasi City.

Increasing population growth, in turn, will suppress demand for land, especially for housing and settlements. The request was then responded by the housing developers by establishing a residential area. Empirical evidence suggests, the land area of 60.07 per cent settlement in 2011 was changed to 61.79 per cent in 2016, converted 1.72 per cent or 2.53 km2 from the total area of 147.19 km2 (BPS City of South Tangerang 2018). In the city of Depok, in the year 2005 settlements land reached 44.31 per cent of the total land area existing and increased to 53.24 per cent in 2012 (BPS City of Depok 2015). In the city of Bekasi, along the 2005-2014 land change for settlements reached 250.32 hectares or changed 58.48 per cent (Cahyaningtyas and Rahayu 2015). While in the city of Tangerang, the area of settlements in 2010 was only 22.13 per cent of the total area of territory, but the amount increased to 26.54 per cent in 2013 (BPS Tangerang City 2015). The growth of the residential land area in Tangerang city reaches an average of 6 per cent per year. Reading the suburban plants in Jabodetabek has an impact on the decline in environmental quality (Sadewo et al. 2018), and it implicates the effort to achieve sustainable development.

The effort to achieve the sustainability of the suburbs is crucial when it is attributed to the fact that more than seventy per cent of the land in the region is used as a residential area, both in the form of housing areas built By developers, as well as residential areas that are built individually by the community. A sustainable suburban area will ensure that people living in the region can live with prosperity, both materially and nonmaterially.

Source Google Map, 2020

Figure 1. Suburban Metropolitan Jakarta

This article reports the results of the development of sustainability indicators of four suburban areas located in the suburbs of Jakarta and their results (Figure 1). The results of the analysis also present the information on sustainability status in all over areas. This article contains the novelty of the aspect: first, it is because the specifications of the observed region are specific to the suburbs in the outskirts of Jakarta, and the area of this research has not been observed by previous researchers. Previous studies have only developed sustainability indicators for an aggregative regional context by combining the unit of analysis into one, wich is the district and the city. Secondly, the study developed the indicators tailored to the context of the suburbs that were not used by previous researchers.

2. DATA AND METHODS

Using the three dimensions of sustainability, the study developed thirty indicators to compile the composite index of sustainable suburban areas like a living area. On the economic dimension, there are eleven indicators, social dimension ten indicators, and environmental dimension nine indicators. Details of the indicator as presented in Table 2. All data use basic data in 2018 from various sources. The indicator selection considerations are adjusted to the suburban region context and the data to support indicators should be available.

In Table 2 is also presented information about the functional relationship of each indicator with sustainability. The functional relationship is described as an upward and downward arrow. An upward arrow indicates that an indicator is positively related to sustainability, and the indicator is also called a "good indicator", or in other words, the indicator has to be maximised to achieve sustainability. A downward arrow indicates that an indicator is negatively related to sustainability, and the indicator is called a "bad indicator", or in other words, the indicator needs to be minimized to achieve sustainability.

This chapter uses a composite index analysis technique developed by Iyengar and Sudarshan (1982). In the next period, this technique was later adopted by the OECD and JRC (2008). This analysis technique develops a multivariate-based index of data to undersize the suburbs based on their sustainability performance. Practically, this analysis technique is also called Min-Max analysis. The strength of this analysis

lies in the measured weighted use of the standard deviation which is then followed up by the sensitivity analysis to see the response of a composite index change in each observed region. The study used four categories of sustainability indices as Kavanagh introduced in 1999 (Table 1). The procedure of the analysis as shown in Figure 2.

Table 1. Sustainability Index

Interval	Annotation
0 - < 25	Unsustainable
25 - < 50	Less sustainable
50 - < 75	Fairly sustainable
75 – 100	Sustainable

Source: Kavanagh, 1999

Table 2. List of Composite Indicator of Suburban Sustainability Index (SSI)

Code	Indicator	Functional relationship with sustainability	Source
Economic (Ec)			
Ec1	Slums (hectare)	↓	Bappeda
Ec2	Percentage of households using electricity (%)	↑	BPS
Ec3	Number of hotels, motels and inns per 1000 inhabitants	↑	BPS
Ec4	The ratio of government development spending to total expenditure (%)	↑	DJPK Kemenkeu
Ec5	Number of traditional markets and Minimart/hyper-mart per 1000 inhabitants	↑	BPS
Ec6	Percentage of secondary and tertiary economic sectors of total GDRP (%)	↑	BPS
Ec7	The ratio of public expenditure to the education sector to total expenditure (%)	↑	DJPK Kemenkeu
Ec8	Health sector public expenditure ratio on total expenditure (%)	↑	DJPK Kemenkeu
Ec9	The ratio of public expenditure on the housing sector and public facilities to total expenditure (%)	↑	DJPK Kemenkeu
Ec10	The ratio of environmental public expenditure to total expenditure (%)	↑	DJPK Kemenkeu
Ec11	Households aged 5 years and above using information technology for the past 3 months (%)	↑	BPS
Social (So)			
So1	Number of traffic accidents last 3 years	↓	Polres and other sources
So2	Number of health facilities per 1000 inhabitants	↑	BPS
So3	Residents who use health care insurance to make their way (%)	↑	BPS
So4	Residents aged 15 years and over are smoking(%)	↓	BPS and other sources
So5	Morbidity (%)	↓	BPS
So6	Unemployment rate (%)	↓	BPS
So7	Average school participation numbers (%)	↑	BPS
So8	Political participation in the local election (%)	↑	KPU
So9	Number of sports facilities per 100 inhabitants	↑	BPS
So10	Average population growth rate (%)	↓	BPS
Environment (En)			
En1	Number of catastrophic events (floods and landslides) last 1 year	↓	BNPB
En2	The average conversion of RTH to an awakened land (%) Last 5 years	↓	BPS, Bappeda
En3	Households using large bowel movements (%)	↑	BPS
En4	Households using faeces disposal facilities (septic tank, IPAL/SPAL) (%)	↑	BPS
En5	Households using the main water source used in households (water p) (%)	↑	BPS

Code	Indicator	Functional relationship with sustainability	Source
En6	Average household waste per day (tonnes)	↓	DLH
En7	Spacious Green open space (%)	↓	Bappeda
En8	Number of waste banks	↑	DLH
En9	Average standard index of air polluters (ISPU) (%)	↓	IQAir, KemenLHK

Annotation: BPS: Local Statistical Bureau, Bappeda: Local Development Planning Agency, DJPK Kemenkeu: Directorate General of Fiscal Decentralization of Finance Ministry, Polres: Resort Police, KPU: General Election Commission, BNPB: National Disaster Management Authority, DLH: Local Environment Bureau, KemenLHK: Ministry of Environment and Forestry.

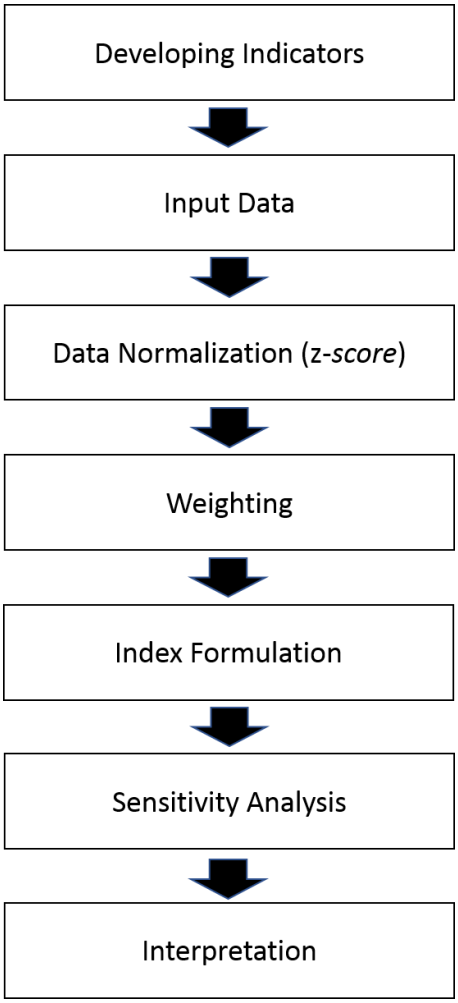


Figure 2. The Procedure of the Analysis

As with the procedure in Figure 1, after the indicator is selected based on data availability, the indicator is grouped into each dimension: economic, social, and environmental. Once the indicator is grouped into each dimension, the next step is to input the data on each indicator in the four observed areas. Data input techniques are done with the help of data processing software MS. Excell. Because it has different units, so the first step is the data must be normalised (standardized). The normalization procedure will result in a uniform normal value of the indicator, regardless of the unit or unit of measurement. The normalization procedure generates data with the invariant measurement unit, the ratio scale. Normalization procedure using Z-score.

In that procedure, for each indicator x_{qc}^{t}, the average across the region $y_{qc=\bar{c}}^{t}$, and the standard deviation across the region $\sigma_{qc=\bar{c}}^{t}$. So, therefore, the normalization formula is:

$$I_{qc}^{t} = \frac{x_{qc}^{t} - x_{qc=\bar{c}}^{t}}{\sigma_{qc=\bar{c}}^{t}} \quad \text{(1)}$$

So that all I_{qc}^{t} have similar dispersion across the region, and the actual minima and maxima of I_{qc}^{t} across region depend on the individual indicator. After the normalization stage is done, the next step is to do the weighted. It is done by the standard deviation formula approach. The next step is to construct a composite index of suburban sustainability with the Min-Max technique for each indicator on each dimension for each region.

In this technique, each indicator x_{qc}^{t} for a generic region c and time t is transformed in $I_{qc}^{t} = \frac{x_{qc}^{t} - \min_{c}\left(x_{q}^{t_0}\right)}{\max_{c}\left(x_{q}^{t_0}\right) - \min_{c}\left(x_{q}^{t_0}\right)}$, where minc (x_{q}^{t}) and maxc (x_{q}^{t}) are the minima and the maximum value of x_{qc}^{t} across all region c at time t. In this way, the normalized indicator I_{qc} have values lying between 0 (laggard, x_{qc}^{t} = minc (x_{q}^{t})), and 1 (leader, x_{qc}^{t} = maxc (x_{q}^{t})). The expression $I_{qc}^{t} = \frac{x_{qc}^{t} - \min_{c}\left(x_{q}^{t_0}\right)}{\max_{c}\left(x_{q}^{t_0}\right) - \min_{c}\left(x_{q}^{t_0}\right)}$ is sometimes used in time-dependent studies (OECD and JSR 2008). The next step is to rank each dimension in each region with the formula:

$$\bar{R}_{S} = \frac{1}{M}\sum_{c=1}^{M}\left|Rank_{ref}\left(CI_{c}\right) - Rank\left(CI_{c}\right)\right| \quad \text{(2)}$$

The next step is to examine the sensitivity of the composite index value by changing the weight on each dimension. The purpose of the sensitivity analysis is to check if the changes are with the composite index or not. Sensitivity analysis is also useful to see if the weight of each dimension weight will change the sustainability rankings of each region. The total effect index sensitivity can be written with equations:

$$S_{Ti} = \frac{V(Y) - V_{X_{-i}}\left(E_{X_i}\left(Y \mid X_{-i}\right)\right)}{V(Y)} = \frac{E_{X_{-i}}\left(V_{X_i}\left(Y \mid X_{-i}\right)\right)}{V(Y)} \quad \text{(3)}$$

3. RESULT AND DISCUSSION

In the composite index, the first phase to do is to develop an indicator. In this study, using thirty indicators as an index forming of sustainable suburban composites. The data used is secondary data published by some institutions. The year of data publication uses basic data in 2018 due to data availability considerations.

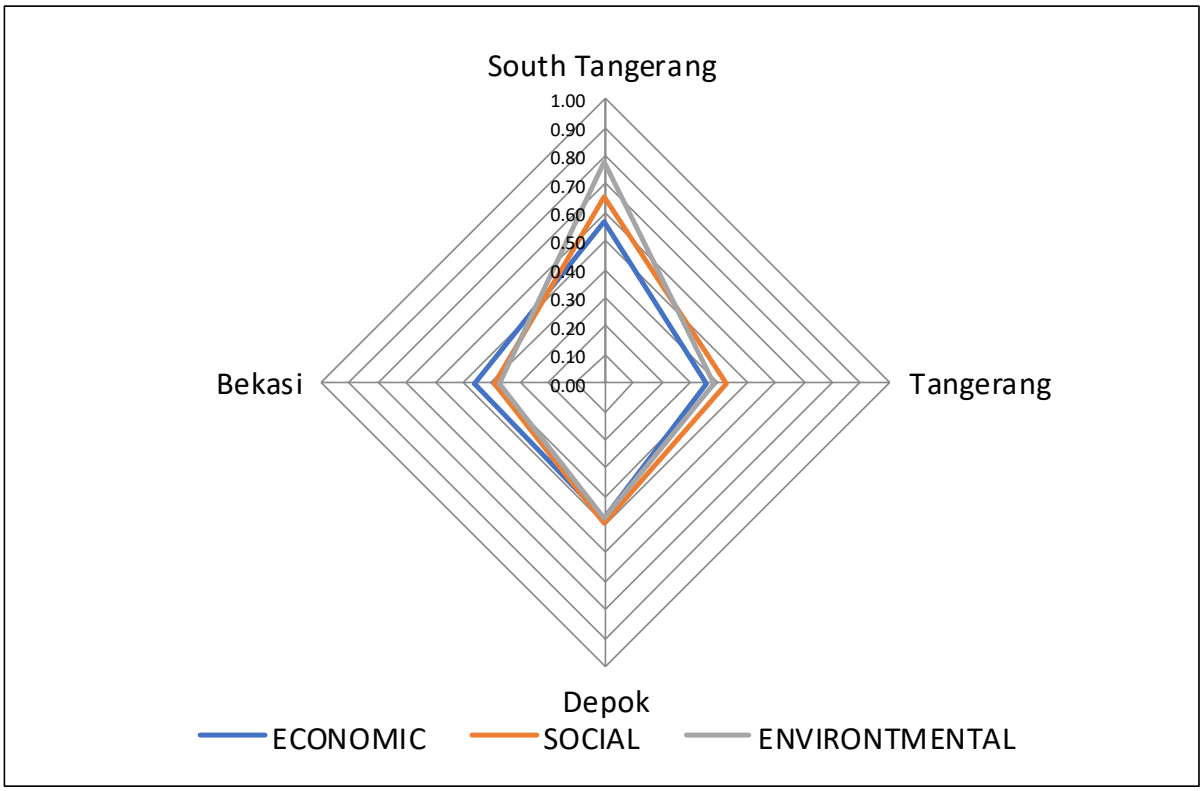
Due to differences in data units, it is done normalization/standardization of data. Using Formula 1 results in the normalization of data as presented in Table 3. Following the instructions and procedures, data normalization results result in a value with a range of at least up to the maximum, whose value ranges from 0 to 1. At this stage, all data is normal and actionable with the next stage, which is to do the weighted. It is done on each indicator and dimension using standard deviation. The result of the weighted value must be one. From the weighted result, the economic dimension value = 0.359; Social = 0.338; and environment = 0.302. The summation of the entire dimensional weight has been worth one.

Table 3. Data Normalization Results

Code	Suburban Region			
	South Tangerang	Tangerang	Depok	Bekasi
Economic				
Ec_1	0,00	0,38	1,00	0,73
Ec_2	1,00	0,00	0,50	1,00
Ec_3	0,62	1,00	0,00	0,19
Ec_4	0,66	1,00	0,01	0,00
Ec_5	1,00	0,23	0,00	0,47
Ec_6	1,00	0,00	0,03	0,71
Ec_7	0,00	0,55	1,00	0,80
Ec_8	0,26	0,00	0,04	1,00
Ec_9	1,00	0,47	0,59	0,00
Ec_{10}	0,00	0,01	1,00	0,21
Ec_{11}	0,78	0,21	1,00	0,00
Social				
So_1	0,05	0,51	1,00	0,00
So_2	1,00	0,61	0,40	0,00
So_3	1,00	0,00	0,69	0,72
So_4	1,00	0,00	0,36	0,53
So_5	1,00	0,00	0,77	0,38
So_6	1,00	0,38	0,55	0,00
So_7	0,81	1,00	0,00	0,38
So_8	0,00	0,30	0,13	1,00
So_9	0,14	0,55	1,00	0,00
So_{10}	0,35	0,99	0,00	1,00
Environment				
En_1	1,00	0,61	0,00	0,78
En_2	1,00	0,58	0,46	0,00
En_3	0,93	0,00	1,00	1,00
En_4	1,00	0,00	0,04	0,56
En_5	1,00	0,00	0,11	0,16
En_6	1,00	0,50	0,64	0,00
En_7	0,46	0,31	1,00	0,00
En_8	0,09	0,49	1,00	0,00
En_9	0,51	0,89	0,00	1,00

Source: data proceeded, 2020

After the weighted finish is done, the next step is to construct the index. At this stage, the value of the index that can be generated is: (1) the value of sustainability indices based on each region's dimensions (Figure 3); (2) the cumulative index of sustainability of each region (Figure 4); and (3) an aggregative sustainability index that presents the information of the index value per dimension and cumulative per region (Figure 5). Composite index recapitulation and state-based sustainability status in the suburbs of Jakarta are presented in table 5.



Source: data proceeded, 2020

Figure 3. SSI Based on Dimensions (Social, Economic, and Environmental)

In Table 4 There is information that indices based on dimensional composite sustainability vary widely between regions. The city of South Tangerang occupies the first position of all dimensions. On social and economic dimensions, each index value reaches 0.65 and 0.57, and the value of this index goes into a fairly sustainable category. While the environment dimension reaches a value of 0.78 with continuous categories.

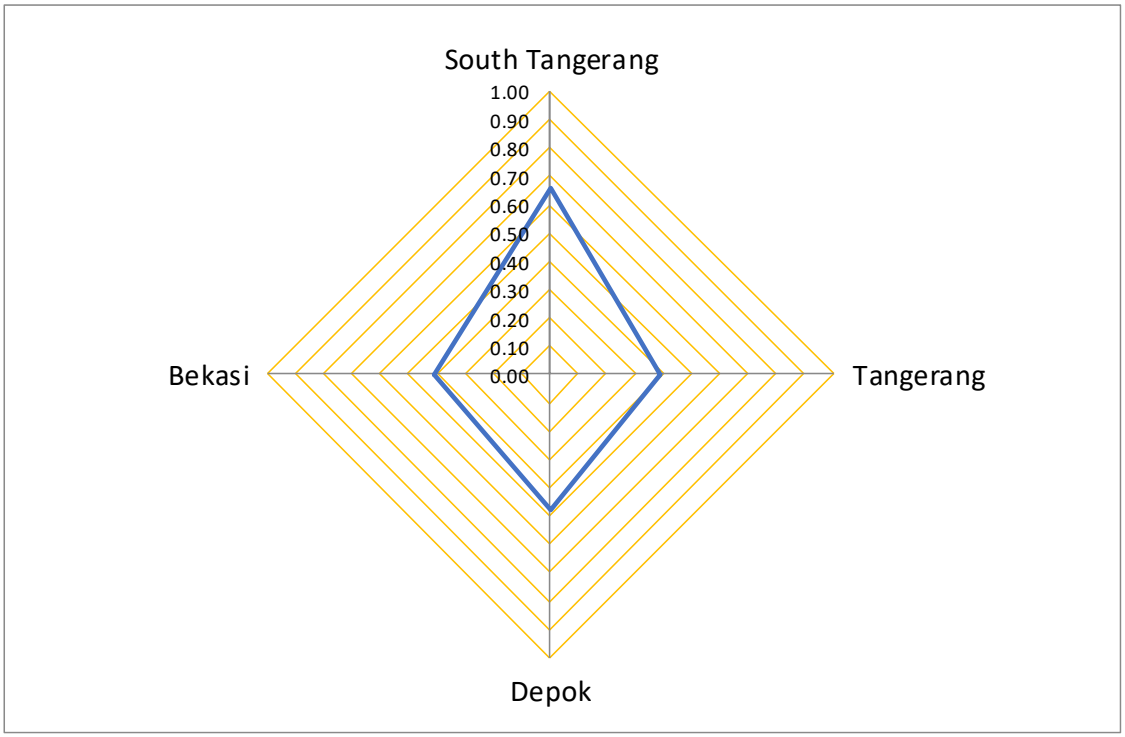
While other regions, sustainability indices across all dimensions are in a less sustainable position. In the city of Tangerang, the social dimension reaches a value of 0.42; Economic dimension reaches 0.35; and the environment dimensions reach a value of 0.39. In Depok City, the social dimension only reaches the value of 0.49; Economic dimension 0.48; and environmental dimensions reach 0.39. In Bekasi City, the social dimension index value reaches 0.39; Economic dimension reaches 0.46; and environmental dimensions reach 0.37. In terms of environmental dimension, Bekasi city has the lowest index value compared to other suburbs (Figure 4 and Table 5).

Table 4. Status of the suburban sustainability index

Suburban Region	Dimension	Sustainability Index			
		Unsustainable (0 - < 25)	Less sustainable (25 - < 50)	Fairly sustainable (50 - < 75)	Sustainable (75 – 100)
South Tangerang	Social	--	--	0,65	--
	Economic	--	--	0,57	--
	Environmental	--	--	--	0,78
Tangerang	Social	--	0,42	--	--
	Economic	--	0,35	--	--
	Environmental	--	0,39	--	--
Depok	Social	--	0,49	--	--
	Economic	--	0,48	--	--

Suburban Region	Dimension	Sustainability Index			
		Unsustainable (0 - < 25)	Less sustainable (25 - < 50)	Fairly sustainable (50 - < 75)	Sustainable (75 – 100)
Bekasi	Environmental	--	0,47	--	--
	Social	--	0,39	--	--
	Economic	--	0,46	--	--
	Environmental	--	0,37	--	--

Source: data proceeded, 2020



Source: data proceeded, 2020

Figure 4. Suburban Sustainability Index (Cumulative)

Interpretation of the entire diagram shows that the better the sustainability of the region, the region's sustainability index line is further away from the zero points. The argument why sustainability indices vary widely between regions due to value variations from the indicators in the economic, social, and environmental dimensions of each region. In this case, based on the indicators that have been developed, South Tangerang City ranks first as a suburban area of sustainability, with a cumulative index value of 0.66. Thereafter followed by the city of Depok with an index value 0.48; Bekasi City 0.41; and Tangerang City 0.39 (Table 5 and Figure 4).

Table 5. Ranking of Suburban Sustainability Index

Region	Dimension			Index	Ranking
	Social	Economic	Environmental		
South Tangerang	0,22	0,21	0,24	0,66	1
Tangerang	0,14	0,13	0,12	0,39	4
Depok	0,17	0,17	0,14	0,48	2
Bekasi	0,13	0,17	0,11	0,41	3

Source: data proceeded, 2020

If we view from the economic structure of the region, the four cities have different characteristics. Although both rely on secondary and tertiary sectors (industry, trade, and services), the difference lies in the type of sector contributing to the GDRP. In South Tangerang city, the dominant sector of the donor portion of GDRP is the real estate sector of 17.72 per cent, wholesale and retail, trade, repair of motor vehicles, and motorcycles of 17.09 per cent and the construction sector at 15.90 per cent (Table 6). While in the city of Tangerang, Depok, and Bekasi, these sectors contribute only 5.24 per cent respectively; 1.56 per cent; and 1.60 per cent for the real estate sector, 10.21 per cent; 22.51 per cent; and 21.77 per cent for wholesale and retail, trade, repair of motor vehicles, and motorcycles. In the construction sector, this sector only accounted for 6.98 per cent of GDRP, 11.53 per cent in Bekasi, and 19.97 per cent in Depok.

Table 6. Percentage Distribution of Gross Regional Domestic Product at Current Market Prices by Industry (2018)

Sector	South Tangerang	Tangerang	Bekasi	Depok
Agriculture, forestry and fisheries	0,24	1,42	0,59	1,39
Mining and quarrying	0,00	0,00	0,00	0,00
Manufacturing	8,97	29,30	33,87	29,92
Electricity and gas	0,15	0,19	1,74	0,30
Water supply, sewerage, waste management, and remediation activities	0,04	0,06	0,09	0,08
Construction	15,90	6,98	11,53	19,97
Wholesale and retail, trade, repair of motor vehicles, and motorcycles	17,09	10,21	22,51	21,77
Transportation and storage	3,35	31,76	10,06	4,43
Accommodation and food services	3,07	1,35	4,07	3,85
Information and communication	10,66	4,36	2,07	1,82
Financial and insurance activities	1,34	2,62	3,12	4,17
Real estate Activities	17,72	5,24	1,56	1,60
Business activities	3,88	1,00	0,46	0,20
Public administration and defence; compulsory social security	1,34	1,14	1,95	2,84
Education	8,91	2,19	2,39	2,93
Human health and social work activities	4,19	0,82	1,12	1,07
Other services activities	3,16	1,36	2,87	3,69

Source: BPS of South Tangerang, Tangerang, Bekasi, and Depok, 2019

Another identifier of South Tangerang city is a sustainable city as a residential area is supported by the high local government expenditure in the residential sector and public facilities, with a ratio of 23.88 per cent of total development spending they spend. While in Tangerang city the spending ratio of this sector is only 19.5 per cent, Depok City is 20.52 per cent, and the city of Bekasi is 15.68 per cent. the information that can strengthen the findings of this research is the city of South Tangerang quite accomplished in the field of housing. This was demonstrated by the recognition of government and private cooperation in the provision of public space in terms of planning and settlement of the Eastern Regional Organization for Planning and Human Settlement (EAROPH) year 2014. In 2019, South Tangerang was also awarded the Real Estate Creative Award from Indonesia Housing magazine in collaboration with DPD Real Estate Indonesia DKI Jakarta. The award is given to creativity, innovation, and synergy between developers and all stakeholders in South Tangerang.

In the social field, although the value of some counterproductive indicators towards achieving sustainability, the surplus of South Tangerang city-based on the indicators developed in this research – compared to other cities observed is the number of Health facilities per 1000 inhabitants are quite high compared to other cities. In South Tangerang city, the value of this indicator reaches 0.234, while in Tangerang City only reach 0.155, in Depok city 0.111; And in the city of Bekasi is even very low, which is only reached 0.03. In other areas of health such as the percentage of people who use health care insurance (BPJS, healthy Cards and others), South Tangerang City is ranked first with a percentage of 62.11 Tpercent,

Tangerang city 51.12 per cent, Depok city 58.7 per cent, and Bekasi city 59.01 per cent. Another indicator that is tried to use is the prevalence of smokers in people aged 15 years and above, South Tangerang city is also low compared to other observed cities, which amounted to 23.66 per cent. While in Tangerang City, the prevalence rate reaches 27.96 per cent, Depok City reaches 25.4 per cent, and the city of Bekasi is 25.7 per cent.

Because it is supported by the public expenditure of health is quite high compared to other cities observed (especially the city of Tangerang and Depok), which is 15.07 per cent, the percentage of pain figures in South Tangerang city is the lowest compared to the cities of Tangerang, Depok, and Bekasi. The mortality rate is the measure of public health in general that is seen from complaints indicating a certain disease. In South Tangerang city, the pain rate only reached 8.31 per cent. Meanwhile, in the city of Tangerang, Depok, and Bekasi City, the number reaches 15.8 per cent, 10.01 per cent, and 12.94 per cent. Other information that became the amplifier is the city of South Tangerang get the predicate of a healthy city for the health services they provide.

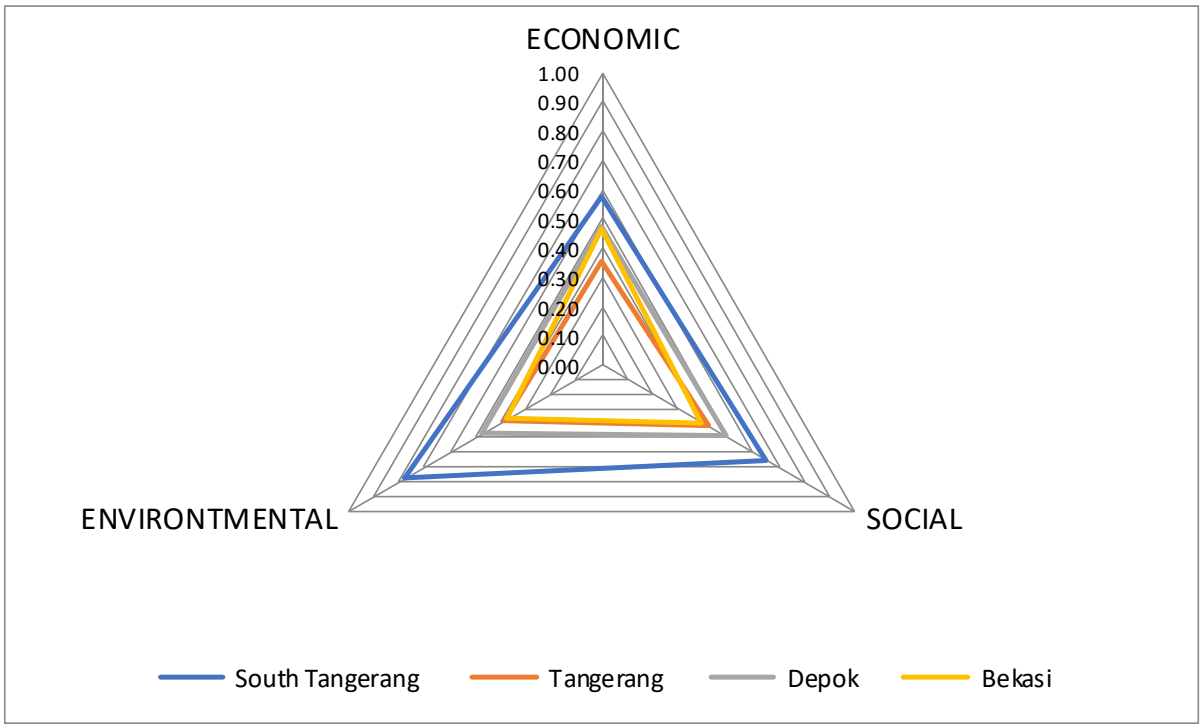
In other indicators, although South Tangerang city has the second-highest population growth rate after Depok city, where the number reaches 3.13 per cent per year and Depok reaches 3.5 per cent per year, the population growth rate is followed by Government intervention in the expenditure of development, especially the health and housing sector expenditure as well as public facilities. This is to be a clear reason why the high population growth rate can contribute to sustainability if government intervention prerequisites are met through the development spending they spend. It implies that with the institutional supported by good governance, the rate of high population growth precisely contributed to the efforts to achieve suburban sustainability.

From the environmental dimension such as land conversion rate indicator in the last five years, South Tangerang City is the lowest region with a conversion rate of 2.04 per cent. While in the city of Tangerang, Depok, and Bekasi, each of them reached 3.29 per cent, 3.63 per cent, and 5 per cent per year. The city of Bekasi is a region with the highest land conversion rate compared to other cities. The city of Bekasi also faces the acute garbage problem, namely Bantar Gebang. Average household waste per day in Bekasi City reaches 1800 tons per day. In the records Kumparan.com (July 21, 2019), as many as 800 thousand pieces of plastic waste from Jakarta dumped into the integrated garbage disposal (TPST) Bantar Gebang in Bekasi City. This indicator can be a confirmation tool why the environmental dimension in Bekasi City is very low, which is 0.11; While the other city reached 0.24 in South Tangerang City, 0.14 in Depok City, and 0.12 in the city of Tangerang.

The garbage from Jakarta was also not followed by good waste governance at its regional level. It is characterized by an indicator of the number of garbage banks found in Bekasi city. In the year 2018, the number of garbage banks in the city of Bekasi amounted to 220 units of garbage banks scattered throughout the district. Compare for example with South Tangerang city which has 239 units of Garbage Bank, Tangerang city has 320 units of the waste bank, and even Depok has 423 units of garbage bank in their city. Unfortunately, it is also not supported by large development spending in the environmental field. Shopping for the development of the environmental field in Bekasi City compared with their total development spending only reached 4.88 per cent in 2018. The ratio is almost the same as the development of the environment in South Tangerang city which reaches 4.55 per cent, Tangerang city 4.57 per cent, and Depok city is even bigger, which is reaching 6.09 per cent. If you see the burden and environmental problems that they are reaching, Bekasi city should put environmental issues as the main issue of their development by giving a greater portion and intervention.

On the other environmental issues, namely, the air quality measured average standard index air polluters (ISPU), South Tangerang city is quite high value. Supposedly, Ispus can be suppressed as low as a maybe so that the efforts to achieve suburban sustainability can be achieved. In the year 2019, IQAir placed South Tangerang city as the worst quality with an average index of 0.81. Nevertheless, the quality of air can be offset by the area of green open space (RTH) is quite spacious when compared with the city of Tangerang and Bekasi city. In the year 2018, the percentage of RTH of South Tangerang City was 22 per cent, Tangerang city 20 per cent, Depok city 28.95 per cent, and the city of Bekasi only 16 per cent. This figure is the reason

why South Tangerang city is the highest in its environmental sustainability index. Moreover, this is supported by the city of South Tangerang as a winner of the planting of one billion international trees in 2014 (www.jakarta.bisnis.com, 1 December 2014). Especially for Depok City, this region has the second-highest sustainability composite index after the city of South Tangerang. One factor of the establishment is RTH in Depok city wider than the other RTH of the city.



Source: data proceeded, 2020

Figure 5. Suburban Sustainability Index (Aggregate)

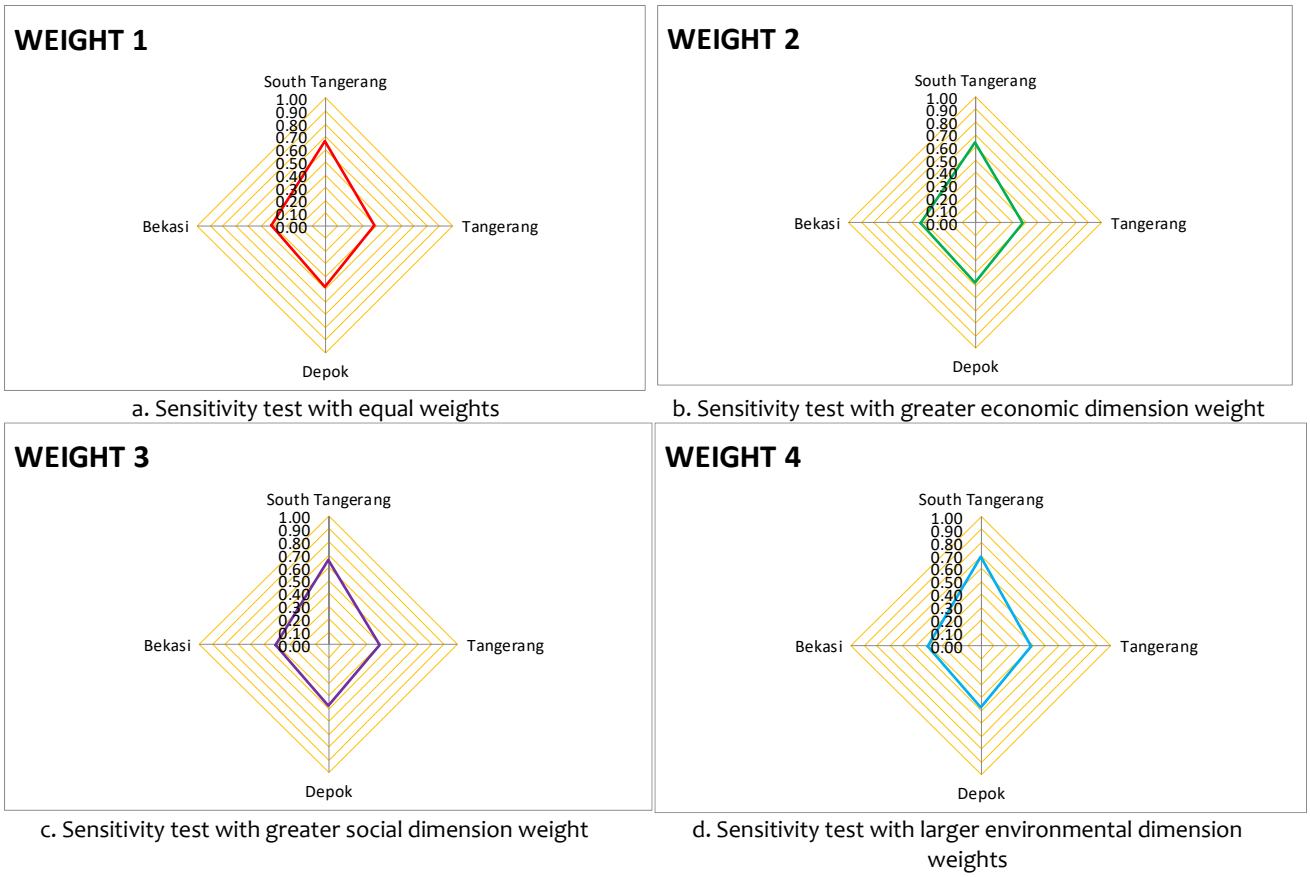
Reading the results, the city of Tangerang became a high area of sustainability. This is information for anyone who wants to stay in South Tangerang city because it is supported by a sustainable economic, social, and environmental capacity. The sustainable city area is a prerequisite to the establishment of a livable city. Detailed overview of the diagrammatic information of the suburban sustainability index of suburbs based on three dimensions of sustainability presented in Figure 5.

The question is, is the value of the composite index that has resulted in suburban region preoccupied with a consistent index value? To answer the question, it is done with a 'sort' scenario with change weights on all three dimensions for each region. In the case of four sensitivity test scenarios, it is: (1) The sensitivity test with a large weight of 0.333 per dimension; (2) sensitivity test with greater economic dimension weight of 0.50; (3) Sensitivity test with greater social dimension weight, i.e. 0.50; and (4) sensitivity test with a larger environmental dimension weight of 0.50 (Figure 6).

Results showed that at the same weight sensitivity test, the composite Sustainability Index remained in South Tangerang city (rank 1), with an index value of 0.66 (Figure 5). In the sensitivity test with the weight of the economic dimension is greater, the city of South Tangerang remains the city with the highest index value, namely 0.64 (rank 1).

This findings support the results of a study conducted by Apriyanto et al. (2015) in South Tangerang city, but at the same time precisely correct it. On the social and economic dimension of the sustainability status of South Tangerang city is quite good. But they say that the environmental dimension is less good. By using seven indicators such as land cover, RTH, protected area, water balance, water quality, waste, and air

quality in the environmental dimension, their study concluded that South Tangerang is less sustainable in the environmental field. In this study, the findings are quite the opposite. It seems everything has changed over the last three years since his research in 2015. The study compares the status of sustainability to the four suburban areas in Jakarta, which is thus known for their sustainability status. So it can thus be known which is more sustainable and which ones are not.



a. Sensitivity test with equal weights

b. Sensitivity test with greater economic dimension weight

c. Sensitivity test with greater social dimension weight

d. Sensitivity test with larger environmental dimension weights

Figure 6. a. Sensitivity test with equal weights, b. Sensitivity test with greater economic dimension weight, c. Sensitivity test with greater social dimension weight, d. Sensitivity test with larger environmental dimension weights

Furthermore, using a larger social dimension weight, the 0.66 index value is generated for South Tangerang city, 0.48 for Depok City, 0.41 for Bekasi City, and 0.40 for Tangerang City. Lastly, using a larger environmental dimension weight, the sustainability index of South Tangerang city is worth 0.69, 0.48 for Depok City, 0.41 for Bekasi City, and 0.38 for Tangerang city. From this information, the calculation results indicate that the index value generates a consistent value for the entire suburban region that is observed across dimensions when the dimensional weight is changed.

4. CONCLUSION

This study results in a composite index of suburban sustainability by observing the Jakarta suburbs. The indicators are developed characteristic of the suburban city as the area where people work in Jakarta. Using different indicators with indicators that have been formulated by the SDGs Metadata indicator of Indonesia (Bappenas) in the year 2017, this research seeks to complement the pre-existing indicators. Thus, the study contributed both theoretically and practically to regional sustainability in Indonesia, particularly

suburban areas. The findings of this research can be a material of thought for each stakeholder in the area that is observed to take the necessary policies for their sustainability status to be improved.

In the perspective of the method, this research relies on secondary data at one point in time, i.e. the only year 2018. Therefore, the composite index of sustainability that has been gained in this study was only constructed and assessed based on that year's data. So that the research conclusion only concluded the status of sustainability in the year concerned. The only reason why it is done is due to data availability. In that context, these limitations can be followed up by using data sequential time so that the composite index value of sustainability can be observed over time. The indicators used still incorporate indicators that are input, output, and outcome/impact. These limitations can be followed up by grouping the indicators into the input, outputs, and outcomes/impact indicators, and then examine them.

5. REFERENCES

Apriyanto, H., Eriyanto, Rustiadi, E., & Mawardi, I., (2015), Status Berkelanjutan Kota Tangerang Selatan-Banten dengan Menggunakan Key Performance Indicators (Sustainable Status of South Tangerang City-Banten Using Key Performance Indicators), *J. Manusia dan Lingkungan*, Vol. 22, No. 2: 260-270.

Bachril, B., Rustiadi, E., Fauzi, A., & Adiwibowo, S., (2017), Regional Sustainable Development Indicator for Developing Countries: Case Study of Provinces in Indonesia, *Int. J. Sustainable Development*, Vol. 21, Nos. 1/2/3/: 102-130.

--------., (2017), Sensitivity Indicator Analysis and Regional Sustainable Development Status in Indonesia, *Jurnal Bina Praja*, 9 (2): 265-280.

Elkington, J. (1997), Cannibals with forks – Triple bottom line of 21st-century business. Stoney Creek, CT: New Society Publishers.

Erlinda, N., Fauzi, A., Sutomo, S., & Putri, E.I.K., (2016), Assessment of Sustainable Regional Development Policies: A Case Study of Jambi Province, Indonesia, *Economics World*, Vol. 4, No. 5: 224-237.

Fauzi, A., & Oxtavianus, A., (2014), The Measurement of Sustainability Development in Indonesia, *Jurnal Ekonomi Pembangunan*, Vol. 15, No. 1: 68-83.

Firman, T., (2000), Rural to Urban Land Conversion in Indonesia During Boom and Bust Period, *Land Use Policy*, 17: 13-20.

-------, (2004), New Town Development in Jakarta Metropolitan Region: a Perspective of Spatial Segregation, *Habitat International*, 28: 349-368.

Firman, T., & Fahmi, F.Z., (2017), The Privatization of Metropolitan Jakarta's (Jabodetabek) Urban Fringes: The Early Stages of "Post-Suburbanization" in Indonesia, *Journal of the American Planning Association*, Vol. 18, No. 1: 68-79.

Finco, A., & Nijkamp, P., (2010), Pathways to Urban Sustainability, *Journal of Environmental Policy & Planning*, Vol. 3 (4): 289-302.

Hidajat, J.T., Sitorus, S.R.P., Rustiadi, E., & Machfud, (2013), Dinamika Pertumbuhan dan Status Keberlanjutan Kawasan Permukiman di Pinggiran Kota Wilayah Metropolitan Jakarta, *Globe*, Vol. 15, No. 1: 93-100.

Iyengar, N.S., & Sudarshan. P., (1982), A Method of Classifying Regions from Multivariate Data. *Economic and Political Weekly*, 17, 2048-2052.

Kavanagh, P. (1999), *Rapfish SPSS automation and analysis of technique*. UBC Fisheries Center, Unpublished report.

Margiyono, & Fauzi, A., (2019), How Sustainable is Regional Development? An Application of Regional Sustainable Account (RSA) Model is East Kalimantan Indonesia, *International Journal of Development and Sustainability*, Vol. 8, Number 7: 422-433.

[OECD dan JRC], (2008), *Handbook on Constructing Composite Indicators Methodology and User Guide*, Paris, France.

Pravitasari, A.E., Rustiadi, E., Mulya, S.P., & Fuadina, L.N., (2018), Developing Regional Sustainability Index as a New Approach for Evaluating Sustainability Performance in Indonesia, *Environment and Ecology Research*, 6 (3): 157-168.

Rahma, H., Fauzi, A., Juanda, B., & Widjojanto, B., (2019), Development of Composite Measure of Regional Sustainable Development in Indonesia, *Sustainability*, 11: 1-16.

Sadewo, E., Syabri, I., & Pradono, (2018), Dampak Post-Suburbanisasi dan Pertumbuhan Perkotaan di Kawasan Pinggiran Metropolitan Jabodetabek terhadap Kerentanan Bencana Banjir, *JGG-Jurnal Green Growth dan Manajemen Lingkungan*, Vol. 7, No. 1: 1-21.

Seghezzo, L., (2009), The Five Dimensions of Sustainability, *Environmental Politics*, Vol. 18, No. 4: 539-556.

Yandri, P., Priyarsono, D.S., Fauzi, A., & Dharmawan, A.H., (2018), Contemporary Studies on Suburban (Indonesia) Today: Critique on Classical-Neoclassical Regional Economics Based Institutional Economics Perspectives, *Jurnal Ekonomi Pembangunan*, 19 (1): 80-93.